

Search and Development of High Performance Thermoelectric Materials: A Controlled Approach

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The goal of this paper is to discuss some of the lessons learned in the areas of research and development of high performance thermoelectric materials. The first part of the discussion addresses the optimization of state-of-the-art thermoelectric materials. For a given material, the process of maximizing ZT in a given temperature range has been classically conducted by two approaches: optimization of the electrical properties and thermal conductivity reductions. The various mechanisms used to achieve the optimum transport properties are briefly reviewed here. The interdependence of the thermal and electrical transport properties imposes some limitations to the magnitude of the improvements in ZT that can be obtained. The implications of these results relative to the selection and evaluation of new materials with a good potential for high ZT values are considered.